Final Report

Assessment of Acceptability, Consumption Behavior, and Market Demand for a Nutritionally Improved Cookie Designed to Help Prevent Anemia during Pregnancy[1]

Institute of Nutrition of Central America and Panama
(INCAP/PAHO)
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Summary

Iron deficiency anemia is the most frequent specific nutritional disorder worldwide despite long standing practices of supplementation and food fortification with iron. Developing countries carry the heaviest load with respect to anemia prevalence and the socioeconomic and individual impact of this disorder. This study undertook the integral evaluation of a nutritionally improved and micronutrient fortified cookie designed by the Institute of Nutrition of Central America and Panama (INCAP) to supply 100% of iron, zinc, vitamins B1, B2, B6, B12, niacin and folate, as well as to provide protein of high quality to non pregnant women. The cookie's nutritional value and its potential advantages as a micronutrient vehicle, such as long shelf life, diversity of shapes, colors, flavors and sizes could be extended to the target population in a sustainable manner only if this product's commercial feasibility were favorable and the demand promising in economic terms. Thus, this study assessed cookie acceptability, cookie consumption behavior and its potential market demand, information that would be crucial for any commercial food product that pretends to compete under Central America's current market forces.

A cookie acceptability survey (n= 253), a consumption behavior trial (n=87) and market demand survey (n=490) were conducted. The market study included Guatemala's capital city (n=382) and 9 districts of Guatemala's second most important province, Quetzaltenango (n=108). For the first two components only pregnant women were included, whereas the market study dealt with a random sample of female heads of household, representative of the target consumer population. The latter component also included the assessment of product acceptability among potential distributors in Guatemala City (1 food industry, 6 supermarkets, 20 general stores, 20 street vendors). In summary, results demonstrate that the cookie is extremely well accepted by final consumers (97%) in terms of its organoleptic characteristics, name (INCAPINA™), price, and packaging. The favorite cookie flavor was vanilla (41.7% vs. 30.8% favoring chocolate); compliance with the recommended consumption schedule (1 package/day for 30 days) was high at both sites and did not differ from that for ferrous sulfate tablets. Its market potential is very promising, since 49% and 59.8% of the Guatemala and Quetzaltenango survey respondents would be willing to buy the product at the suggested price (US$0.23) if it were available in the snack food market, respectively. And an additional 38% would buy the cookie regularly if the price were reduced to US$0.15 per 50-gram pack. Price reduction is feasible, since estimated production and sales cost is approximately US$0.08, as well as necessary, because the prices of other competing products vary around the amount suggested by the respondents. The study yielded important and useful facts about the low level of knowledge of most women regarding the nutritional value of the foods that make up their typical diets, and, on the other hand, it revealed that once the information about the nutritional advantages of a certain new food product is given to the final consumer this turns into the most important factor in favor of its purchase and consumption. Of the 97.5% who stated they would consume the cookie, 51% would do so because of its nutritional value, where as 29.7% would consume it because of its flavor.

Conservative economic and demographic assumptions were used to estimate the national market size for the cookie. The weekly demand for the cookie in Guatemala city at US$0.23/pack and US$0.15/pack was estimated at 5.7 and 3 MT, respectively.

On the other hand, before launching the commercialization of the cookie, some changes should be operated on the currently available product, such as improving the quality and design (particularly the colors and figures) of the package, increasing the size and improving the shapes of the cookies within each package. Price should be reduced and the target consumer population should be extended to include school children as well. With respect to the projection of demand, the study points out that maintaining a high level of quality control (taste, texture, shape, durability) is important to consumers and potential distributors, and should be secured early during the implementation of any future production/commercialization plan.

Acceptability, Consumption and Commercial Viability of a Nutritionally Improved Cookie designed to Prevent Anemia during Pregnancy : Final Report

Institute of Nutrition of Central America and Panama
USAID/JS-Mothercare

I. Introduction

Iron deficiency persists as the most frequent specific nutritional deficiency world-wide. Most cases of anemia in developing countries are associated with iron deficiency and concentrate in fertile age women, infants, and young children. In Central America, anemia affects 39% of pregnant women in Guatemala, 52% in Belize, 34% in Nicaragua, 30% in Honduras, and 27% in Costa Rica. It is well known that the physical and cognitive liabilities of iron deficiency anemia limit individual as well as population development and that no single food-based intervention suffices to eradicate anemia as a public health problem. Thus, from a public health perspective, it is well within the interests of developing countries to have cost-effective alternatives for iron deficiency prevention. This study undertook the assessment of a micronutrient fortified cookie made from a composite corn/wheat/soy flour in terms of acceptability, regular consumption and market potential as an alimentary alternative to improve the iron nutritional status during pregnancy. The acceptability survey, the consumption trial and the market survey were carried out in the two largest cities of Guatemala: Guatemala and Quetzaltenango.

II. Background

Food fortification (universal or targeted) has proven effective to help decrease the deficiencies of vitamin A and iodine in Central America. Proof of this statement is the fact that El Salvador, Guatemala and Honduras currently fortify sugar with retinol and all the countries add iodine to common table salt. Guatemala was the first Latin American nation to launch successful sugar and iodine fortification programs at the national level. Admittedly, no one dietary intervention will suffice the unmet requirements of second and third trimester pregnant women. However, from a public health point of view it is important to test large scale, diet-based, targeted fortification alternatives that will improve the iron nutriture of its population's most vulnerable population: women of child-bearing age and preschool children. With this goal in mind the Institute of Nutrition of Central America and Panama (INCAP) and USAID/Mothercare set out to study the feasibility of extending to women the benefits of specially designed nutritionally improved cookie much like the nutritionally improved and micronutrient-fortified cookie that is still being delivered to school children in Panama and Nicaragua. This food-based alternative is intended as a preventive measure against global nutritional deficiency with special emphasis on the prevention of nutritional anemia.

The composition of the flour used to manufacture the school snack cookies (SSC) is dehulled corn flour, defatted soy flour, and wheat flour (80% extraction). This mixture has a relatively high

protein quality (81% that of milk) and each 28 g cookie should supply 100% of the RDD for Vitamin A, 40% the RDI of iron, 23% the RDI for protein, and about 10% the RDI for energy for children 7 to 10 years old. Essentially the same macroingredients were used to produce a 50 g cookie with a different micronutrient profile, designed for women (CW) of child bearing age (15-48 years of age). The vitamin-mineral premix for the CW contains no vitamin A (though beta carotene could be used for populations at risk of vitamin A deficiency); its iron, folic acid and zinc contents are adjusted to supply the RDI for adult non pregnant women. The iron fortificant (ferrous fumarate, 33% elemental iron), provides 24 mg of iron per 50 g cookie, and the intended iron:zinc molar ratio (<2:0) should not cause interference with zinc bioavailability. Assuming a conservative 5% absorption rate for iron within such food matrix, this amount of iron represents 50% the RDI for non-pregnant women (see appendix I). Nonetheless, two cookies/day would fulfill the total RDI during pregnancy. The production and sales cost of a 50 g cookie is approximately US$0.08.

Moreover, INCAP has conducted a preliminary acceptability trial for the CW, using either bovine RBCP or ferrous fumarate (FF) as iron source for a chocolate and a vanilla flavored cookie, respectively[2]. In these trial 72 adult women of varied educational levels, ethnic background, and residence (rural/urban) participated. Each woman individually tried a vanilla and a chocolate cookie, consecutively. Women were asked about taste (like or dislike), flavor preference (vanilla or chocolate), opinion about the size (adequate or inadequate), texture (soft or hard/toasted), smell (like or dislike) and their reasons for each of their choices. They were also asked to choose a name for the cookie from a list containing the six most popular names according to a "name the cookie" contest carried out previously at INCAP.

Results are summarized for all women, since no differences were found between groups. Literally all women liked the CW. More women (58%) liked the chocolate cookie, and the main reason given for this preference was that the vanilla cookie resembles the SSC too much. Those who did not like the chocolate cookie stated a natural dislike for chocolate in any product. Regarding texture, the subjects said that the chocolate cookie was more toasted ("crunchy") than the vanilla one. The smell criterion was also in favor of the chocolate cookie. Women suggested that the square shape of the CW be changed so that it did not resemble the SSC. They also suggested that instead of a cookie a "sweet bread" be prepared because the latter is a food commonly eaten by adult women during breakfast or as snacks, and cookies are not.

It should be noted that most women shared their cookies with their children, which did not allow assessing their response to size per se, but suggests that this will very likely be the behavior when women are provided cookies during trials. All children seemed to like the CW. For these trial, the CW's were transported in plastic bags (24/pack) and were exposed to different temperature and climatic conditions during short periods of time, and they did not suffer appreciable deterioration. The normal shelf life of the CW is approximately 1 month. However, the complete shelf life of cookies with commercially attractive modifications (toppings, for instance) is not

[2] The iron concentration of this cookies (9 mg/100 g) was smaller than half the iron contents (48 mg/100 g) of the product subject of this report (INCAPINA™).

known and should be explored.

It may be concluded that the CW is an acceptable and desired food item under the conditions of this acceptability trial. The question still remains as to its commercial potential. This is a crucial issue, since sustainability of food-based iron nutrition interventions is essential to secure long term achievements in the struggle to control and prevent iron deficiency and iron deficiency anemia.

This report describes the findings of (1) an acceptability survey among pregnant women; (2) a 30 day field trial that evaluated consumer consumption behavior (compliance) of either 1 CW/day or 1 ferrous sulfate-folic acid tablet/day, and (2) a market study which explores the commercial feasibility of the CW within the snack food market of the 2 most important urban centers of Guatemala: Guatemala and Quetzaltenango.

III. Research Problem Statement

The low bioavailability of the iron in traditional rural diets, the reportedly low tolerance of and compliance with daily medicinal iron supplements, the high requirements for iron during pregnancy, and the high prevalence of anemia among women combine to demand for multiple and complementary alimentary alternatives to help control the problem of iron deficiency anemia in developing countries. To be successful food-based alternatives, such as the CW, should be culturally and economically acceptable as well as biologically efficacious. An accurate assessment of the product's acceptability and commercial potential should precede any further efforts to propose the CW as a worthwhile alternative for the control and prevention of iron deficiency anemia. As originally conceived such evaluation should study product acceptability, consumption behavior regarding the product, its market potential and, finally, the products field effectiveness.

IV. Overall Design

This study included the 3 following interdependent components performed in Guatemala City and communities of the western highlands in the province of Quetzaltenango:

1. A product acceptability survey among pregnant women,
2. A 30-day consumption behavior ("compliance") trial, and
3. A commercial and economic feasibility study.

V. Objectives

A. General Objective

To asses the potential for sustainability of the nutritionally improved CW, designed as a commercial food-vehicle to deliver iron and other essential nutrients in adequate amounts for women of child-bearing age.

B. Specific Objectives

1. Acceptability Survey

To assess product acceptability of chocolate, vanilla and pineapple- flavored CW's in terms of flavor, taste, color, smell, texture, size, and package preference.

2. Behavior Trial

To assess behaviors regarding compliance with daily consumption of the CW (with 24 mg elemental iron/50 g) or daily consumption of iron/folate pills (30 mg elemental iron/tablet) during a 30 day trial.

3. Commercial and Financial Feasibility Study

(a) To determine the potential market space for the CW's in Quetzaltenango and Guatemala City, the two potentially largest commercial markets in the country.

(b) To identify facilitating and limiting factors regarding marketing (e.g. name, price, packaging), commercial potential (consumer purchasing power and preferences) and promotion/communication strategies for product launching.

(c) To estimate the financial feasibility for commercialization of the CW.

VI. Methodology

A. Acceptability survey

In Guatemala City 144 volunteer pregnant women from the prenatal clinics of the Instituto Guatemalteco de Seguridad Social, IGSS, were approached during enrollment in the prenatal care program and asked to try the cookies in their 3 flavors (chocolate, vanilla, & pineapple), rinsing their mouths with distilled water between flavors. Their opinions about the cookies were recorded by previously trained and experienced female field personnel.

In the province of Quetzaltenango, the acceptability survey was conducted by trained, native, female, bilingual field workers, who surveyed 109 volunteer pregnant women from 2 predominantly Maya-Mam communities (San Juan , Palestina), 5 predominantly Maya-Kiché communities (Almolonga, Cantel, Salcaja, Olintepeque, San Mateo, La Esperanza). At both sites training and supervision was carried out by the collaborating social scientist (Christa Valverde) in coordination with the nutritionist in charge of field coordination (Patricia Chiong). CV processed and analyzed the qualitative data collected.

B. Behavior and Compliance Trial

In Guatemala, the volunteer pregnant women with a gestational age less than 20 weeks, without anemia (hemoglobin adjusted for altitude >11.7 g/dL) who enrolled in the prenatal care program of the IGSS were recruited for the 30-day behavior and compliance trial. All subjects were interviewed initially (Instrument #1) to gather baseline information regarding their health condition prior to the interview. This information would allow discriminating the origin of secondary effects or ailments imputable by the subjects to either treatment during follow-up. After obtaining oral consent from the subjects, they were randomly assigned to receive daily for a period of 30-days, either (A) one 50 g bag of vanilla cookies (24 mg iron as ferrous fumarate per bag) or (B) one iron (60mg as ferrous sulfate) + folic acid (0.25 mg) tablet. To obtain relevant data regarding consumption of the assigned treatments (Instruments #2 and #3, respectively) recruited women were scheduled to receive 2 further visits at home during the study (i.e. after 15 and 30 days of treatment). In Guatemala city 64% of the women recruited could not be revisited at home, since most of the addresses given by the subjects could not be found, while a few others were located in areas of the city inaccessible to people foreign to the area. In conclusion, 59 subjects (28 with cookies and 31 with tablets) participated in the behavior and compliance trial in the following way: 45 subjects received 2 visits, 14 subjects received only 1 visit (3 of the subjects had already given birth by the time of the second visit and 11 subjects could not be located during several attempts). Of the 45 subjects who completed the trial successfully, 22 belonged to the cookie group and 23 to the iron/folic acid tablets group. Of the 14 subjects who were visited only once after 15 days of treatment allocation 5 belonged to the cookie group and 9 to the tablet group.

In Quetzaltenango, 120 volunteer pregnant women from the same 9 communities used for the acceptability survey were recruited for the 30-day behavior trial. The same strategy and procedures described for sample selection in Guatemala city were carried out in Quetzaltenango. Next they were randomly assigned to one of the 2 treatment groups (n=60 subjects/group), and follow-up visits were scheduled.

At both sites, stool samples were collected to measure iron concentration as a more objective means to confirm compliance (Pizarro F, et. al. 1987). The first sample was collected before and the second one during treatment. Samples were collected during the morning and transported to INCAP the same day for iron measurement.

C. Market Study

1. Guatemala city: a private Guatemalan marketing group (Asociación Desarrollo para Todos, ASODESPT) was hired to conduct the assessment of the cookie's market niche and commercial potential of the CW in Guatemala City. ASODESPT adjusted its technical and economic proposal to meet our budgeted resources several times. The accorded study estimated product demand from two potential customers: the final consumer (n=382 women of child bearing age) and the intermediate consumer or "commercialization channels" (n=20 corner vendors, 20 small neighborhood general stores, 6 supermarkets, 10 distributors and 1 food industry). Sample size for the final consumer survey was calculated accepting a 95% level of confidence and sampling error of 5%, using an estimated proportion for demand of 50% and a population size of 206,618 women of child bearing years living in Guatemala City:

$$\textbf{Sample size} = z^2 N p q / (z^2 p q + NE^2)$$

Approval by both institutions to begin data collection was preceded by thorough revision and validation of the survey methodology (Annex 1) and instruments. Initially, male field workers were hired and trained by ASODESPT and were assigned specific sectors of the city (sampling frame: 21 zones in Guatemala City + peri-urban Mixco= 22 zones). House selection within each sector was carried out at the convenience of each field worker. Based on process evaluation of these field workers' training and performance, a new work team had to be assembled and trained for the actual survey. ASODESPT's new study team was strengthened by a specialist in marketing studies, a social worker for field work supervision and 8 new and adequately trained surveyors (5 women and 3 men). The "final consumer questionnaire" (annex 1) was further revised and modified, since the previous document contained technical jargon and vague questions that were not understood by study subjects. Additionally, before data collection began ASODESPT also complied with our request for an extra field work supervisor who should be selected and trained by INCAP's project director and field coordinator and should report and respond only to the latter two[3].

Under strict and independent quality control measures from INCAP and ASODESPT, a total of 383 questionnaires were filled for an equal number of households selected by the surveyors within each of the sectors which had been assigned at random (annex 2). All questionnaires were revised for obvious incoherences and missing data. A random sample of the households (20%)

[3] These negotiations delayed the continuation of the marketing study to the point that actual data collection ended on the third week of September. Data processing ended during the second week of October. The first draft of the marketting study report was delivered during the first week of November. And the second draft report was discussed during the second week of December.

was revisited by the field coordinator or the independent supervisor to verify the data recorded by the field workers. No significant flaws or systematic errors were found during supervision and data processing.
Data processing included assigning numerical codes to the answers provided for all open questions, descriptive statistics of variables, and cross tabulation of variable combinations requested by ASODESPT for information interpretation and report elaboration (October 12).

2. Quetzaltenango City: we decided to use the revised survey questionnaire produced collaboratively with ASODESPT to carry out a separate consumer demand survey in the city of Quetzaltenango. After adequate training and familiarization with the questionnaire and interview techniques, one experienced female field assistant conducted 108 interviews to assess consumer demand for the nutritionally improved cookie in Quetzaltenango. The interviews were done at a rate of approximately 12 households per urban zone (Quetzaltenango has 10 zones). (This sample size accepts a type I error of 5%, sampling error of 9% and uses a population size of 22,930 and product demand proportion of 70%.)

VII. Results, Discussion of Findings, and Conclusions from each Study Component

A. Product Acceptability

1. Guatemala and Quetzaltenango samples combined

The total sample for the acceptability survey (253 pregnant women) was composed by 144 women living in Guatemala City and 109 from the province of Quetzaltenango. This sample can be characterized in the following terms:

(a) The majority of the participating subjects belong to the Spanish speaking "ladino" ethnic group (78%) and the rest belong to an "indigenous ethnic" group.

(b) Fifty-four percent of the subjects belong to the middle class, and the rest were classified as having a lower socioeconomic status (46%).

(c) Average gestational age at the moment of the acceptability survey was 6 months.

(d) In general, this was a relatively well educated sample since only 12% had not have any education at all, around 20% had finished primary school,18% secondary school and 20% had even finished the pre-university grades by the time of the interview.

(e) As expected from such a sample, 72% of the subjects had a correct or partially correct biological concept about the definition of anemia. In addition, most of the subjects knew how to recognize some of the common signs and symptoms of anemia (87%).

Regarding the acceptability of the fortified cookie, results show that in general the 3

flavors were very well accepted (99% of the participants). More specifically, 39% of the sample preferred the chocolate cookie, 38% preferred the vanilla cookie, and 22% preferred the pineapple cookie. The main reasons stated for preferring the chocolate cookie were normal preference for chocolate itself (46%), its better taste in comparison with the other two options (25%) or its degree of sweetness ("sweeter") (7%). The actual shape and appearance of the cookies were also well accepted by the majority of the subjects (93%). Ninety-two percent of the total sample liked the small size of the cookies in comparison with other cookies available in the market.

To describe the overall acceptability of the cookies, a composite score was calculated (the sum of the individual scores given for appearance, size, taste, odor, and consistency), as the same bipolar scale (1-5) was used for grading the cookies' organoleptic characteristics. The range of possible values for the composite score is 0-25, the lowest scores reflecting lack of acceptability. As the following table shows, the lowest composite score obtained was 16, and only 14.7% of responders scored the cookies 20 or lower. The rest (85.3%) graded the cookies as highly acceptable (composite score > 21). The total average score was 22.9 ± 2.0.

Table 1: global scores for acceptability of the cookies (both samples merged)

Composite acceptability score (range: 0-25)	Frequency (No. of respondents)	Percent	Cumulative percent
<16	0	0	0
16	1	0.4	0.4
17	2	0.8	1.2
18	5	2.0	3.2
19	7	2.8	6.0
20	22	8.7	14.7
21	21	8.3	22.8
22	35	13.8	36.6
23	42	16.5	53.1
24	50	19.7	72.8
25	69	27.2	100.0
Total	254		

Analysis of results by geographical area permits the identification of some important sample features which are described below.

2. Guatemala City Sample

Sample characteristics:

(a) Ninety-six percent of the sample belonged to the Spanish "ladino" ethnic group.

(b) Fifty-four percent of the sample had a subjectively graded "medium" socioeconomic status.

(c) Average maternal age was 26.7 $\pm$ 5.8 years.

(d) Average gestational age was 6.0 $\pm$ 2.0 months.

(e) Sixty percent of the sample lived in the marginal urban area. Only 9% belonged to the rural area.

(f) Twenty-four percent of the sample had finished primary school, 28% had finished at least 1 year of secondary school, and 25% had at least 2 years of pre-university preparation. Nine percent of the sample had not had any formal education.

Product acceptability: Chocolate was the preferred flavor (43%) followed by vanilla (37%) and pineapple (19%). Among the main reasons for preferring the chocolate cookie were a) inherent preference for the chocolate flavor itself, and b) the chocolate cookie's better taste when compared to the other 2 flavors.

A great majority of the subjects liked (95%) the appearance of the cookies, mainly because they considered the shapes as "pretty" (46%) or because each bag of cookies contained a variety of shapes (17%). The size of the cookies was also well accepted by the majority of subjects (92%) mainly because they considered it as appropriate for a cookie (47%) or because the cookies were easily handled and eaten (21%). Regarding the overall flavor of the cookies, 74% of the subjects liked very much because of the natural preference for the chocolate or vanilla flavor and because the cookies tasted appropriately like chocolate or vanilla (31%), other reasons were that the cookies were very tasty (15%) or because they were "not boring" (13%). Ninety-four percent of the subjects like the aroma of the cookies and the main reason was that the scent was pleasant and not offensively strong (56%). The majority of the subjects liked the consistency of the cookies (95%) and the main reasons were its appropriate degree of "crunchiness" (47%) and its hard consistency (17%). Finally, 80% of the sample from Guatemala liked the package of the cookie mainly because it was "attractive" and "cute" (72%) and therefore they did not consider it necessary to change anything about the package.

In Guatemala City, the mean composite score for global cookie acceptability was 22.9 + 1.98. Only 0.7% respondents gave the cookies a score lower than or equal to 16 points, and 12.5% of the subjects scored the cookies at 20 or less points. Most respondents (87.5%) graded the cookie acceptability as excellent (>20 points).

3. Quetzaltenango sample

(a) Fifty-four percent of the sample belonged to the Spanish "Ladino" ethnic group.

(b) Average maternal age was 25.5 $\pm$ 6.4 years.

(c) Average gestational age was 6.3 ± 2.0 months

(d) Fifty-three percent of the sample had a medium socioeconomic status

(e) Thirty-nine percent of the sample lived in the rural area

(f) Eighteen percent of the sample had finished primary school, 17% had finished at least 1 year of secondary school and 13% at least 1 year of pre-university preparation. Twenty-two percent of the sample had not had any formal education at all.

Vanilla was the preferred flavor (39%) followed by chocolate (34%) and pineapple (25%). Among the main reasons for preferring the vanilla cookie were a)the vanilla flavor by itself and b) the better taste compare to the other cookies.

In the province of Quetzaltenango, the mean composite score for global cookie acceptability was 22.8 + 2.4. None of the respondents gave the cookies a score lower than or equal to 16 points, and 17.4% of the subjects scored the cookies at 20 or less points. Most respondents (82.6%) graded the cookie acceptability as excellent (>20 points).

The reasons for this choice were the subjects' natural dislike for the chocolate or pineapple flavor (38%) or that the subjects found something wrong with the chocolate (bitterness) or the pineapple flavors used to manufacture the cookies (21%). As for the Guatemala city sample, the great majority of the participants liked the shapes of the cookies (90%) because the shape was considered as being "pretty" (54%) or because the package contained a variety of shapes (18%). The majority of the sample also liked the size of the cookies (93%) because it was considered as appropriate ("normal") for a cookie (50%) or because the cookies were easy to handle and eat (18%). Overall, the flavor of the cookies was highly acceptable (98%), mainly because of the respondents natural preference for the selected flavor, or because the selected flavor was most clearly tasted (30%), or because the cookies were "very tasty" or "not boring" (29%). The aroma of the cookies was also accepted by most of the sample (92%) and the main reason for this favorable opinion was that the scent was pleasant (28%) or simply "nice" (26%). Regarding the consistency of the cookies, 91% of the sample liked it mainly because its appropriate degree of toasting (38%) or because it was considered as having a hard consistency (16%) or just an "appropriate consistency" (15%). Finally, 80% of the sample from Quetzaltenango liked the packing of the cookies because they considered it as being "appropriate" in size, color and contents for a commercial cookie (43%) or just "pretty… attractive… cute" (29%).

Table 2: Summary of sample characteristics by study site: acceptability survey

Characteristic	Guatemala City	Quetzaltenango Province	t or X^2 statistic: value (p)
Age in years (mean ± SD)	26.7 ± 5.8	25.5 ± 6.4	2.291 (0.1273)
Gestational Age in months (mean ± SD)	6 ± 2.0	6.3 ± 2.0	2.638 (0.1015)

≤ 6 years of school (%)	45.1	52.3	1.27 (0.2594)
Preferred cookie flavor (%)	Chocolate (43%)	Vanilla (39%)	2.15 (0.3405)
Ladino respondents (%)	96	54	65.5 (<0.0001)
Middle class+ respondents (%)	54	53	0.05 (0.8599)
Residence in the rural area (%)	9	39	32.71 (<0.0001)

4. Main Conclusions from the acceptability survey

(a) The nutritionally improved and micronutrient-fortified cookies were well accepted by the vast majority of respondents in both study sites in terms of flavor, color, size, texture and shape. In Guatemala chocolate was the preferred type of cookie while the vanilla cookie was preferred in Quetzaltenango. The main reasons for flavor preferences were basically the same for both samples.
(b) In Guatemala the predominant ethnic group was the Ladino while in Quetzaltenango almost one half of the sample belonged to the Indigenous ethnic groups.
(c) Most of the subjects interviewed in Guatemala City lived in the marginal urban area while in Quetzaltenango the rural area seems to be the place of residency of most of the participating subjects.
(d) There was no significant difference regarding the socioeconomic status of the samples, since the medium status prevails in both places.
(e) There was no significant difference regarding the maternal and gestational age between both samples.
(f) An important but non-significant difference was observed between sub-samples, regarding their educational level: the Guatemalan sample seemed to be more educated than the sample in Quetzaltenango. For instance, in Guatemala 24% of the sample had finished primary school compared to 18% in Quetzaltenango. However, the main indication of the education difference between these samples is that in Guatemala only 9% of the sample had not have any education at all compare to 22% of the sample in Quetzaltenango.

B. Behavior trial Results

1. Compliance with cookie schedule

For the cookie compliance trial 87 pregnant women participated from a total sample of 212 pregnant women. The sample was composed of 27 pregnant women who lived in the peri-urban Guatemala City and 60 pregnant women who lived in the Province of Quetzaltenango (province capital and 8 district townships).

The cookies for the trial were given from June 3 to July 3, 1998. The average age was 24 years old ranging from 14 to 40 years old. Ten percent of the sample were illiterate, 22.1% had finished primary school, 12.8% had finished secondary school and 1.2% was a graduate from the

University as a Lawyer. Half of the population belonged to the "ladino" group and half belonged to the ethnic group Maya-Kiché and Maya-Mam.

The majority of the population sample lived in houses with cement floor, walls made of block or "adobe". Most of the them own a gas stove, some "poyo" stone bench similar to a stove, made of adobe and very few will cook in the floor. Most of the them had piped water and electricity and live in houses of 2, 3 or 4 rooms, which belonged to their in-laws or their parents, with whom they lived with.

The first visit took place after 15 days of consuming the cookies from June 15 to July 17; and the second visit from June 25 to July 13 after a month in order to find out about consumption. Seventy eight pregnant women were visited the second time. Out of the nine women missing three had already deliver the baby and the rest didn't show at IGSS for their appointment. All of them belonged to the "ladino" group.

The following results were found:

(a) Except for three women all remembered the recommendations given.

(b) When they were asked to tell what we recommended that day in 49% of the cases the answer was correct, 44% partially correct, and only 7.15% was totally incorrect. They remembered perfectly well that the cookie substituted the prenatal pill, this was specially expressed by women who attended the prenatal clinics of the Social Security Institute (IGSS), contrary to women from Quetzaltenango who answered correctly during the second interview.

(c) Except for five women who attended IGSS clinics, all the subjects received their cookies on the same day that the recommendations were given. When questioned regarding this issue, the majority of women said that the cookies were useful for pregnant women to prevent anemia and for the baby.

(d) All the women had eaten the cookies. When asked about the number of bags of cookies eaten, the majority referred having eaten one bag a day during the period preceding the visit. Very few admitted that some times they had forgotten to eat them every day and one subject stated she did not eat the cookies because she was bored with the routine. Seventy five percent ate it as a morning snack and accompany it with any of the following beverages, listed in descending order of preference: water, "atoles", coffee, lemonade, soft drinks, milk, orange drink or tea. The rest ate it as an afternoon snack. Eleven percent ate the cookies alone. The majority ate the cookies instead of the morning snack (74.2%), some instead of breakfast (16.7%) and one fourth of the sample said they ate the cookies as a complement. During the second visit they said they did not eat the cookies accompanied with coffee as in the first visit.

(e) Fifty five percent said that they felt fine after consuming the cookies, 23% that they felt very full, 5.7% they felt the same and the rest that they felt sick with nausea, agitation, thirsty, sour mouth. In those cases the symptoms appeared before they start eating the cookies.

(f) One third of the sample shared their cookies with their children (42.3%), husbands (30.8%), relatives (15.4%) and friends (11.5%).

(g) Forty one percent of the sample said that in order to remember that they have to eat the cookies they did things to facilitate remembering it like place them in a visible place (77.8%) or asked a relative to remind her. Fifty eight percent of the sample didn't do anything to recall, but some said that sometimes they forgot to eat them.

(h) At the time of the first interview the majority (92%) were still eating the cookies. The remaining said that they were not eating because they felt sick, bored or had finished the cookies.

(i) During the time of consuming the cookies, 65% of the sample said that they felt stronger than ever, "le ha dado fuerzas", (it had given them strength), they have increased their appetite, they have felt better or "le ha sustentado". Twenty two percent said that they felt the same, and very few that mentioned that they felt sick were because of the nausea that they have had before.

(j) Ninety percent thought that the cookies were "sabrosas" (term to describe a good flavor of food), the rest said that the cookies were "feas" (term to describe a bad flavor of food) being the reason for it that they were very sweet. Seventy percent classified the cookies as "caliente" (hot), the rest as either "frío" (cold) or "fresco" (fresh). All of them said that they were "alimento" (nutritious food); 74% said it was light, 67% that was digestible and the rest said that "se repite".

(k) Ninety percent of the sample said cookies were very good for pregnant women.

2. Compliance with iron pills schedule

For the iron pills compliance trial 92 pregnant women participated from a total sample of 212 pregnant women. The sample was composed of 32 pregnant women who lived in the peri-urban Guatemala City and attended the IGSS clinics and 60 from the Departmento of Quetzaltenango and its 8 Municipios.

The iron pills for the trial were given from June 4 to July 4, 1998. The average age was 26 years old ranging from 14 to 43 years old. Seventeen percent of the sample were illiterate, 33% had finished primary school, 8% had finished secondary school and 2.2% were students at university level. Fifty four percent of the sample belonged to the "ladino" group and the rest belonged to the ethnic group Maya-Kiché and Maya-Mam.

Sixty five percent of the sample lived in houses with cement floor the rest in houses with earth floor. Fifty two percent of the houses were built of block and 39% of "adobe". Fifty seven percent of the sample cook in a gas stove, 38% in "poyo" stone bench similar to a stove, made of adobe, and the rest in the floor. Most of the them had piped water and electricity and live in houses of 2, 3 or 4 rooms, which belonged to their in-laws or their parents, with whom they lived with.

The first visit took place after 15 days of consuming the iron pills from June 18 to July 24; and the second visit after a month, in order to find out about consumption. Seventy eight pregnant women were visited the second time. Out of the 4 women missing nine did not show at IGSS for their appointment. All of them belonged to the "ladino group" and lived in the peri-urban Guatemala City. The rest had already deliver the baby. The following results were found:

(a) All women in the sample remembered the recommendations given.

(b) When they were asked to tell what we recommended that day in 53.3%% of the cases the answer was correct, 35.9% partially correct, and only 7.15% did not know, mostly because the information given at IGSS was limited to the type of treatment they were going to get.

(c) All of them received their iron pills the same day that the recommendations were given, except for five women, who attended the IGSS prenatal care clinics and were given them in the next appointment. The majority of them said that the iron pills help to prevent anemia in pregnant women and to help the baby born strong and healthy.

(d) Except for three pregnant women, all have taken the iron pills. From the three that did not take the pills, two said that they kept them and one that she has thrown them away because they have made her sick. When asked how many iron pills they have left some of them said that the pills had turn into powder se "desposalaron" or they had already finished the treatment because in some cases they have taken three iron pills daily, and some others two. Seventy eight percent ate it at breakfast time with water, lemonade or orange drink. The rest took them during the day as they remembered.

(e) Sixty two percent of the sample said that they felt fine after taking the iron pills, 11.2% that they felt the same, and the rest they felt sick with "agruras" sourness, headache and sleepy. In those cases the symptoms appeared before they started taking the treatment.

(f) Except for four pregnant women who shared their pills with pregnant friends, all of them took their iron pills.

(g) Sixty three percent of the sample did not do anything to remember they have to take the iron pill. Thirty seven percent of the sample said that in order to remember they have to take the

iron pills they did things to facilitate remembering like place them in a visible place (67.4%) or asked a relative to remind them.

(h) At the time of this first interview the majority (79.3%) were still taking the iron pills. The remaining said that they were not taking them because they felt sick and the doctor recommended after the baby was born in order to feel the effect.

(i) During the time of consuming the pills, 53.3% of the sample said they felt stronger. Twenty two percent said they felt the same, and very few that mentioned they felt sick was because of the same symptoms they had experienced before such as vomiting, headache, sleepiness, constipation, stomach ache, tiredness, weakness.

(j) Fifty nine percent of the sample classified the pills as "caliente" hot. The majority thought they were nutritious food, light, digestible, and very good for pregnant women.

3. Fecal iron concentration among study subjects

Case description of stool iron concentration – a preliminary experiment: prior to analyzing the stool samples obtained from the study subjects we conducted a small experiment with an iron replete, normal vegetarian subject from INCAP who takes multivitamins and mineral supplements regularly. This subject abstained from supplements during 5 consecutive days. During the next 3 days she provided one stool sample per day to establish her basal fecal iron concentration. After these 3 days, the subject ingested one tablet containing 60 mg of iron (as ferrous sulfate) with breakfast. Every day for the following 4 days she provided a stool sample for monitoring the iron excretion pattern after one oral dose of 60 mg of supplemental iron (Fig 1). One week after this first period of observation, the subject ingested 120 mg of iron with breakfast. Follow up of this iron was performed during the next 5 days.

In both cases, 24 hours after tablet(s) intake, stool iron had increased three-fold over the baseline value. Seventy two hours after intake of 60 mg of iron , the iron concentration was still 50% higher than baseline (9.4 mg/100 g). Three days after the 120 mg dose the stool iron concentration was still 185% greater than the baseline value (6.1 mg/100 g). From these data it can be inferred that one dose of medicinal iron at pharmacological levels can be clearly detected during the following 72 hours. Moreover, it is also evident from the baseline iron levels at the beginning of both trials that individual fecal iron concentration varies with the diet and perhaps with the cycle of intestinal mucosal turnover (9.3 and 6.1 mg/100 g, respectively).

Table 3: Stool iron concentration before and after intake of 60 or 120 mg of iron from ferrous sulfate tablets

Day	Stool iron concentration (mg/100 g fresh sample) and dose of iron (mg)	
	Single dose of 60 mg iron	Single dose of 120 mg iron
0. Baseline	9.3	6.1
1 day after dose	25.9	18.7

2 days after dose	32.5	15.4
3 days after dose	14.4	17.4
4 days after dose	10.2	6.4
5 days after dose	-----	8.7

Field trial results: in order to get an idea of the reliability of compliance results derived from counting the number of "remaining doses", a convenience sub-sample of subjects were asked to provide 2 stool samples: the first one before the trial started and the second one 15 to 30 days later when the follow-up visit was carried out. Fresh samples were placed in new, pre-washed plastic containers with lids by each study subject . Field assistants collected the samples between 8 and 10 AM. On the day of collection the samples were transported in an icebox at ambient temperature to INCAP in Guatemala City where they were kept at 4^{o} C until analysis.

As shown in table No.4, 24 stool samples were processed. However, only 10 complete sets of samples (baseline and follow-up) were obtained. Four follow-up samples could not be collected due to the subject not being at home as previously convened (n=1), or the subject refusing to provide the second sample (n=2), or the subject's home being inaccessible because of weather conditions on the day scheduled for sample collection (n=1).

Seven of the 10 complete pairs of samples came from women assigned to the cookie group (7 from Quetzaltenango and 3 from Guatemala). Apparent consumption of treatments among these 10 women was high: 87-100% for the 6 women from Quetzaltenango stated compliance with the cookie consumption schedule; 93% for the subjects from Quetzaltenango consuming tablets; 100% for the subject from Guatemala city cookie group. One of the women in the Guatemala city tablet group complied 100%; contrary to instructions, the other subject (no. 057) in this group took 2 tablets per day but only during 80% of the time.

Table 4: Stool iron concentration before and during treatment in specimens from a sub-sample of subjects from both study sites

ID	Residence	Treatment	Number of cookies/tablets consumed (days)	Type of drink used to accompany treatment consumption	Stool iron concentration (mg/100 g)		
					Baseline (a)	During treatment (b)	[(a-b)/a] x 100
150	Cantel	Cookie	20 (20)	Water	1.9	4.4	+132%
153	Cantel	Cookie	8 (15)	Coffee	4.6	3.0	- 34.8
154	Cantel	Cookie	13 (15)	Water	4.4	8.5	+93.2
101	Xela	Cookie	14 (15)	Coffee	2.9	6.5	+124.1
152	Cantel	Cookie	20 (20)	Water	5.5	6.2	+12.7
151	Cantel	Cookie	14 (15)	Coffee	4.4	5.8	+31.8
104	**Salcajá**	**Tablet**	**14 (15)**	**Water**	**15.6**	**8.2**	**-90.2**
115	Cantel	Cookie	--	--	3.8	--	--
089	Cantel	Cookie	--	--	4.5	--	--
043	Guatemala	Cookie	15 (15)	Coffee	8.0	11.2	+40.0
057	Guatemala	Tablet	24 (15)	Water	5.2	3.6	-30.8
024	Guatemala	Tablet	30 (30)	Coffee	2.7	3.9	+44.4

092	Guatemala	Cookie	--	--	3.7	--	--
088	Guatemala	Tablet	--	--	2.8	--	--

Despite the instructions given at the beginning of the trial regarding treatment consumption, practically 50% of all subjects consumed the cookies with coffee. One of the 3 subjects from the tablet group used coffee as well. The remainder of the subjects took the assigned treatment with plain water.

Considering the results of all the baseline stool samples collected, it is apparent that the average stool iron concentration was similar in both study sites: 5.29 $\pm$ 4.01 mg/100 g in Quetzaltenango and 4.48 $\pm$ 2.21 mg/100 g in Guatemala (t=0.171, p=0.68861, NS). However, if the abnormally elevated sample from Quetzaltenango (ID=104) is excluded, the average iron concentration for the highlands group decreases noticeably to 4.0 $\pm$ 1.12 mg/100 g but is not different from the Guatemala group (t=0.275, p=0.61519, NS).

In general, the iron contents of the follow-up samples were greater than baseline for the 7 samples under cookie treatment (+2.07 $\pm$ 1.8 mg/100 g) and only slightly lower for the 2 subjects taking tablets (0.100 $\pm$ 1.56 mg/100 g). Iron concentration for the 6 final samples from Quetzaltenango's cookie group increased (45%) by an average of 1.88 mg/100 g (from 3.95 to 5.73 mg/100 g). After exclusion of case 104, the increasing trend reversed or disappeared (from 3.95 to 3.75 mg/100 g) in the tablet group.

Interpretation of results

Analysis of the baseline and follow-up stool iron concentrations of the samples from the behavior trial shows an increase for 7 of the 10 pairs in relation to the baseline values. However, the magnitude of the increase is much smaller than expected, considering the experimental results described above.

There are 3 non-exclusive possible explanations for this finding: (1) the subjects did not consume the treatments and the observed increase is due to normal variation of the parameter (stool iron concentration); (2) during pregnancy iron absorption increases (from 7% during the first trimester to approximately 66% at 36 weeks of gestation. Higher absorption translates into decreased excretion of ingested iron. (3) Iron deficiency also causes absorption to increase. However, we have not hematological data to state that the study subjects who provided the stool samples were iron deficient. Nonetheless, the second mechanism alone would help explain the small magnitude of the observed trend in stool iron concentrations and support the conclusion that given the increased absorption rates that occur during late pregnancy our results may be attributed to increased iron intake attained through subject compliance with treatment consumption.

Apparent compliance in both groups and study sites was high. The stool iron data do not contradict this statement but they do not strongly support it either. Stool iron results could be interpreted as evidence of the indicator's normal variability and not necessarily as evidence of a

recent increase in dietary iron intake. As shown by the preliminary iron excretion experiment, stool iron concentration increased by 178% 24 hours after intake of one tablet with 60 mg of iron. On day 2 after ingestion of the tablet, iron concentration was 249% higher than baseline. On day 3, iron concentration decreased but was still 55% higher than the baseline value. Fecal iron concentration were back to baseline values 4 days after intake of the iron tablet. A similar pattern was observed when the iron dose was doubled. Only this time iron concentration was back to baseline values 3 days after intake of the 120 mg of iron. These results seem to support the contention that in an iron replete adult non-pregnant woman iron absorption is low and excretion of medicinal dose of the mineral is high and prolonged.

On the other hand, one might have expected consistently lower iron concentrations in the samples from coffee drinkers. This was not the case at all mainly because the "coffee" consumed by individuals from the socioeconomic stratum of our study samples is actually a mixture of toasted local cereal grains (i.e. corn and barley) and the concentration of iron absorption inhibitors from the coffee itself should be minimal.

Overall, stool iron measurement had too low of a coverage to allow for meaningful inferences regarding compliance. From a practical point of view, assuming compliance with treatment, our results might show that the stool iron concentration of pregnant women receiving 24 mg of iron from the cookies or 60 mg of medicinal iron in tablet form increases only slightly and such small change could be interpreted as within normal variability of iron excretion for "probably" iron depleted pregnant women.

Conclusion

Even though the observed increase of stool iron concentration during treatment is much smaller than expected, it may be attributed "cautiously" to compliance with treatment consumption. On the other hand, uncontrolled sources of confounding (i.e. iron nutritional status, dietary iron sources, etc.) and the small sample size do not allow making categorical inferences regarding the usefulness of stool iron measurements as a reliable method to corroborate consumption of the treatments under study.

C. Commercial Viability Study Results

1. Final Consumer Survey

(a) Product Demand

In order to estimate product demand and supply different parameters, such as sensory evaluation, price preference, family income, cookie acceptability, declared intention to consume and/or buy the product were collected in Guatemala city through 382 interviews of female heads-of-household randomly selected within each of the 16 popular zones (of 22) into which the city is divided. In addition, 22 potential distributors of the product were interviewed regarding their opinion about price and package characteristics in order to estimate potential demand from this

intermediate consumer sector.

Assuming 28% capacity to actually buy the product, 10% minimum effective commercialization and final consumer price of US$0.23/package containing 50 g of cookies (exchange rate US$1 = Q6.48) the potential weekly demand from the capital city was estimated at 3 MT. Lowering the price to Q1.00 yielded an estimate of 5.7 MT/week. Extrapolating this figure with an expected yearly per family consumption of 36.6 lb./year, the national market size for the cookie was estimated at 2.06 million women which translate into a potential demand for 11,000 MT (equivalent to sales of Q202,400,000/year). The actual proportion of this market share effectively consuming the product depends on several factors, such as the educational level of final consumers, the intensity and efficacy of product promotion and advertising, the installation of an effective quality assurance system, price stability, improvement of the package according to consumer and distributor recommendations, and consolidation of a working supply and distribution system.

Analysis of the sample's food consumption habits also yielded important facts that should be addressed by a forthcoming product advertisement campaign. For instance, lunch was considered as the single most important meal by 50.1% and 55.2% of the subjects in Guatemala and Quetzaltenango, respectively, followed by breakfast (36.7% and 41%). On the other hand, in Guatemala City only 11% and 13% of the sample routinely have an afternoon snack or morning snack, respectively. The provincial sample snacks regularly slightly more often: 15% in the morning and/or 21.7% in the afternoon.

Regarding the foods most frequently consumed by the families in Guatemala City, milk (22.9%), beans (16.4%), beef (13%), cereals (8.5%), eggs (8.5%), pasta/noodles (5.9%) and Incaparina (5.1%) were the items mentioned more often by the respondents. In Quetzaltenango city, beans (23.4%), vegetables (16.8%), meats (14.0%), milk (12.1%), and eggs (10.3%) were the items consumed more frequently. The nutrition-related factors most frequently mentioned as the principal contribution of the routinely consumed food items in Guatemala were calcium (18.6%), vitamins (17.8%), a general nutritive nature (11.6%), proteins (9.1%), iron (8.7%), other nutritional reasons (10.3%). It should be pointed out that 10% of the subjects provided non-nutritional reasons for consuming the foods listed above (habit, tradition, etc.). In Quetzaltenango, caloric content (31.4%) and vitamins (25.7%) were by far the most common nutritional factors mentioned, while only 2% of respondents stated a non nutritional reason for considering the food item an important component of the traditional diet.

The menu of the snacks for school age children was explored also. In general, most families (68%) include some sort of sandwich (beans, ham, cheese) and 33% include cookies.

Sensory evaluation of the cookies: 97.5% of the sample stated willingness to consume the cookie (40% because of its nutritional value, 29% because of its flavor, 11% for both these reasons). The respective figures for Quetzaltenango were 34%, 48.6%, and 0%. In Guatemala City, flavor preference results show that 52.4% selected one of the 3 flavors because it had the best taste,

23% because the selected flavor was their favorite flavor, 4.5% because the flavor was original or different, and 2.7% because the cookie tasted non-artificial. Vanilla was the more frequently selected single flavor (42.1% in Guatemala and 39.3% in Quetzaltenango), followed by chocolate in Guatemala (30.1%) and pineapple in Quetzaltenango (30.8%). These results provide valuable information for advertising purposes which help identify potentially effective core messages such as "[better or good] nutrition tastes good".

In general, it can be inferred that the organoleptic qualities of the cookies were well accepted by the women of the survey at both sites. Combined positive responses for the 2 sites were as follow: color (96.3%), size (73.2%), shape (83.6%), texture (90.4%). The most frequent objection to the size of the cookies by adults was its small size. Regarding the shape of the cookie, 55.6% of those who disliked it did so because they preferred round (55.6%) or square (22.2%) shapes or because the shape of the test cookies was "indeterminate" or "ill defined" (11.1%). Sixty eight of those who rejected the texture of the cookie said the cookie was too hard to bite. On the other hand, 48.9% of the sample said they would pay the suggested price (Q1.50/package), while 79% of those who did not (38% of the total) stated that they would indeed buy the cookie if the price was lowered to Q1.00/package. Only 9.3% and 3.8% of the subjects said they wouldn't buy the cookie unless each package cost Q0.75 or Q0.50, respectively.

When questioned about the name of the cookie (INCAPINA) 80.1% of the respondents said the name was acceptable (64.2% because the name was adequate, 8.2% because it was pretty, 7.7% because the name was associated with INCAP. However, 14.6% of the sample rejected to the name INCAPINA, mainly because it is "boring or not modern" (2.8% of the total), "not of their particular liking" (5.7%), or just "strange" (2.6%). The logical recommendation from these findings is that a more proper name be identified which is easy to remember and reflects the nutritional advantages of the product.

Regarding package size, 85.7% of the replies were favorable, mainly because "it is adequate" (42.9%), or because it "fits enough cookies" (28.6%), or because "it is easy to carry" (28.6%). The presentation or appearance of the package was accepted by 88.2% of the survey sample because "it looked nice" or was considered "attractive" (31.2%), it was "adequate for a cookie" (18.5%), or because its colors were "nice" (12.4%).

Potential distributors, however, graded the package as "providing insufficient protection for the product", as having an "unattractive combination of colors", and of "low printing quality". Moreover, they graded the package as of "low competitive capacity". Therefore, package quality should be substantially modified and improved according to these observations.

The estimated weekly demand for the cookie was widely spread (range 1-49/week). Most respondents (79.4%) estimated a foreseeable weekly demand per household of 3-12, averaging 9 packages/week.

(b) Product distributors survey in Guatemala city: the most frequently stated observations from this stratum were the following:

- Focusing on women may cause distrust (sterilization, for example).
- Cookies are usually packed in bags of larger size rather than individual packages.
- The suggested name (INCAPINA) is not adequate. It may cause rejection, particularly from children.
- Commercialization in supermarkets and distributors will require packs of 6-12 units. This would avoid theft and minimize deterioration on the display shelves, for example.
- The current presentation looks like snacks for other than nutritional purposes.
- The colors of the current packages are too bright and are not well combined. They are not attractive and do not fit in with current marketing tendencies.
- There are at least 3 types of cookies in the market which also provide high quality nutrition and count with well defined marketing strategies.
- The support for publicity and promotion which can be expected from the producer should be clearly defined.

2. Product Supply

The analysis of supply was based on supply of other cookies and nutritional supplements in the market. In general, it may be concluded that (1) INCAPINA would enter a highly competitive market in either instance. (2) No one product seems to dominate the cookie or nutritional supplements market. However, within the cookie market the 3 principal competitors are CHIKY (27%), GAMA (11.1%), and POZUELO (14.6%), and salted crackers (11.4%). And within the nutritional supplements, generic and brand name multivitamins were consumed most frequently (35.4%), followed by a diversity of preparations containing calcium (16.8%). (3) Of the vast majority who stated willingness to buy the cookie, only a low percentage considers nutritional value as the most relevant factor regarding the reasons to buy INCAPINA (13.9%).

3. Market Size

An estimated 2.06 million women of child-bearing age yield a yearly national market size of 11,000 MT, assuming 27% effective economic capacity to purchase the product at a yearly rate of 36.56 lb./year (1 bag/week). On the other hand, based on a limited analysis focused on product acceptability among potential distributors it is recommended that production costs be kept under Q0.75/bag.

4. Profit margins

Since the product is not actually available in the market, it is not possible to establish with precision the profits each commercialization channel should obtain. However, given the information collected from potential product commercialization intermediaries and data from similar products, retailers should get at least 25% profit.

5. Conclusions

(a) INCAPINA can be incorporated profitably and permanently into the snack food market by a company that is both technically and financially able to promote its massive introduction.

(b) Because of its almost universal acceptability, the intent to consume the cookie (potential demand) is high (over 95%). "Effective demand" at the capital city for the product is lower (48.1%), as this indicator adjusts for the actual purchasing power or buying capability of potential consumers. Thus, "effective demand" at an average consumption rate of seventy 50 gram bags per capita per year is estimated at approximately 41 metric tons (MT) per week. If the unit price is lowered from Q1.50 to Q1.00 effective demand could increase to 90%, which is equivalent to weekly sales of 76 MT. According to results from economic modeling, economic return rates for production and commercialization of the cookie could be between 22.74% and 27.5%, depending on the price for final consumers.

6. Recommendations

(a) The cookie should be promoted within the target population group without differentiating between social strata. The population segment without economic access to the commercial version of the cookie can be tended by non government and/or government programs.

(b) Product distribution strategy should focus on large population segments and a unit price of Q1.00/bag of 50 grams.

(c) INCAP should promptly initiate negotiations with potential producers/distributors after having clearly defined the institutional conditions by which commercial agreements should established.

References

Ministry of Public Health of Guatemala. Encuesta Nacional de Deficiencias de Micronutrientes. (1995) UNICEF/MOTHERCARE/CE/INCAP/CONAPLAM.

Ministry of Public Health of Belize. Study of iron Deficiency Anaemia among Pregnant Women in Belize. (January 1996). MOH-Bel/PAHO-INCAP/UNICEF.

Ministry of Public Health and Public Assistance of Nicaragua (MINSA). Encuesta Nacional sobre Deficiencia de Micronutrientes en Nicaragua, 1993. MINSA-Nicaragua/ USAID/PAHO-INCAP.

FAO. Sinopsis Alimentaria y Nutricional de America Latina. Rlac/95/19-NUT-61 Santiago, Chile (1995).

Am. J. Clin Nutr 1993. p. 137

Barrett JFR, Whittaker PG, Willias JG, Lind T. Absorption of non-haem iron from food during normal pregnancy. Br Med J 1994; 309:79-82.

Pizarro F, Amar M, Stekel A. Determination of iron in stools as a method to monitor consumption of iron-fortified products in infants. Am J Clin Nut 1987; 45:484-487.